भारतीय मानक
Indian Standard

IS 5182 (Part 5) : 2020

वायु प्रदूषण को मापने के तरीके

भाग 5 गैसीय प्रदूषण के नमूने

(पहला पुनरीक्षण)

Methods for Measurement of Air Pollution

Part 5 Sampling of Gaseous Pollutants

(First Revision)

ICS 13.040.20

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September 2020 **Price Group 4**

Air Quality Sectional Committee, CHD 35

FOREWORD

This Indian Standard (Part 5) (First Revision) was adopted by the Bureau of Indian Standards after the draft finalized by the Air Quality Sectional Committee had been approved by the Chemical Division Council.

For determination of concentration of a gaseous pollutant in air, it is necessary to obtain representative samples of air at number of strategic points. The concentrations are likely to vary with time and distance from the source of pollution depending upon the nature of release, meteorological factors and local conditions such as topography and presence of buildings or vegetation. The measured concentrations are also known to depend upon the average time, namely, the period of sampling. These aspects are required to be taken into account for sampling and interpretation of the measured values. There should be a number of strategic points and samplings. Recommended practice prescribed in this standard is based on the experience gained in sampling air at conditions prevalent in this country.

This standard was originally published in 1975. In the formulation of this standard considerable assistance was derived from the work done in this field by National Environmental Engineering Research Institute (NEERI), Nagpur. In this revision, modifications have been made to scope, figures and apparatus section as per the latest methods used for determination of pollutants. Additional sections on sample handling have been added.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 :1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

METHODS FOR MEASUREMENT OF AIR POLLUTION

PART 5 SAMPLING OF GASEOUS POLLUTANTS

(First Revision)

1 SCOPE

This standard (Part 5) describes the method of sampling applicable to the gaseous pollutants in the air, such as oxides of nitrogen and sulphur, ammonia, chlorine and hydrogen sulphide which react fast with liquid absorbing reagents at atmospheric temperature and pressure when air is bubbled through the absorbing solution in the impinger (also known as bubblers).

2 REFERENCE

The standard listed below contains provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards.

IS No.	*Title*
IS 2303 (Part 1/ Sec 1) : 2012/ ISO 719 : 1985	Grading glass Part 1 Method of test and classification Section 1 Hydrolytic resistance of glass grains at 98°C (*Second Revision*)

3 SAMPLING STATION

3.1 Location

3.1.1 The sampling station should be selected so as to serve the exact purpose of investigation. For general city level it should be so located with respect to various sources, and the meteorological factors prevailing in the area that it gives a sample of pollution prevalent in the area reasonably representative. For local industrial pollution survey, it may be located to give maximum levels from that particular source.

3.1.2 The sampling station should have a free exposure, so that it does not collect air from a stagnant pocket. It should be away from large buildings which may interfere in free air circulation. It should be located at a height of minimum 1.5 m but not exceeding 15 m from the ground.

3.1.3 The sampling point should be such that it is not directly influenced by any local source emission meant for general study pollution level survey. For local investigation, it should be located to serve the exact purpose. Public buildings like city schools, laboratories, police stations, hospitals, municipal and government offices are more suitable because of their easy accessibility and security. The sample site should avoid contamination due to heavy automobile traffic or any such type of local effects.

3.2 Number of Sampling Stations

The number of stations in the sampling network will depend upon the purpose of investigation. Broadly, area survey and long term survey require a network which is more or less uniformly distributed, preferably in a rectangular grid. Individual short term surveys or spot surveys for limited stations should be done in area which is getting influenced by the air pollution activities.

4 APPARATUS

4.1 The equipment to be used for gaseous air sampling should consist of a standard impinger of 35 ml capacity, a trap, a flowmeter or critical orifice device and a suction pump. The arrangement of the sampling train is illustrated in Fig. 1.

4.2 Sampling Train

A typical sampling train is shown in Fig. 1 comprising an impinger, trap, flowmeter, valve and pump. However, if desired, critical orifice device may be substituted for conventional trap, flowmeter and valve assembly. The impinger shall be protected from direct sunlight.

4.3 Impingers / Bubblers

Glass standard midget or fritted impingers shall be used for collection of gaseous pollutants in community air sampling. These glass impingers shall be made from HGB 1 glass conforming to IS 2303 (Part 1/Sec 1) : 2012/ISO 719 : 1985.

4.3.1 Glass impingers, commonly called midget impingers, are of 35 ml capacity, 22 cm in length and 2.6 cm wide, impinging end of the tube 1 mm bore size

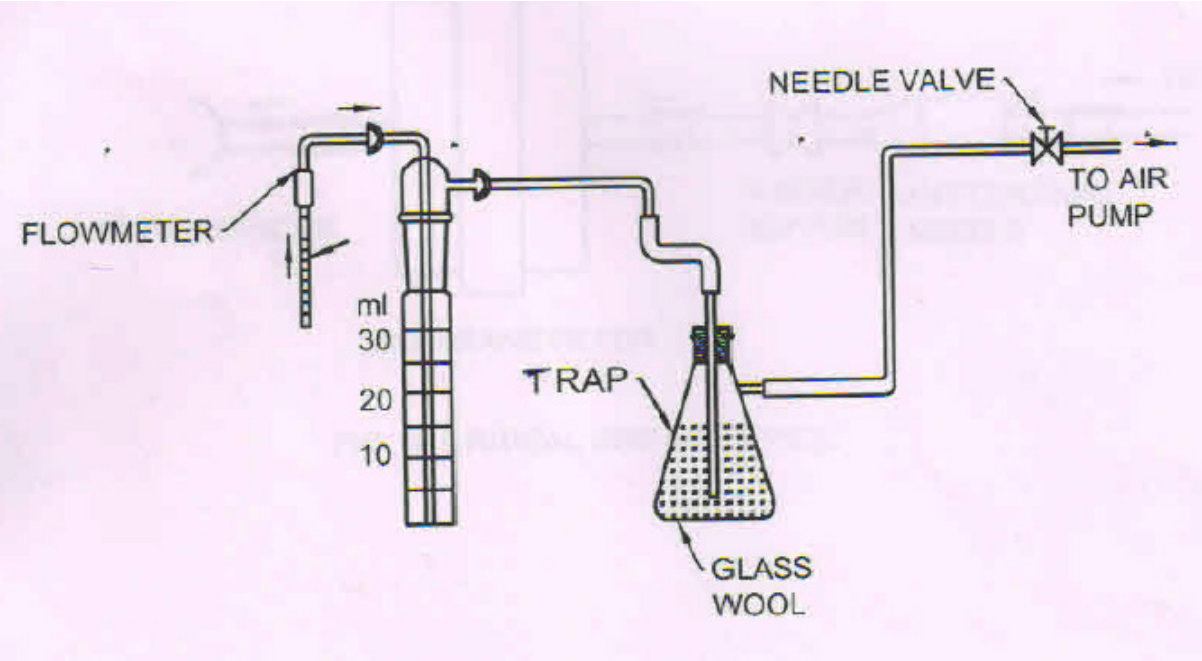


FIG. 1 SAMPLING TRAIN

or preferably with fritted disc with porosity 50 microns or less. Details of two types of midget impingers are given in Fig. 2 and Fig. 3.

4.3.2 These units usually provide the most efficient collection of gaseous pollutants. The fritted part of the dispersion tube is readily available in the forms of a disc or cylinder of various pore sizes. Under the optimum condition of flow rate, absorbing medium and type of pollutant, the fritted glass impingers have a collection efficiency in excess of 90 percent.

4.3.3 Units which use frits of approximately 50 microns or less pore size gradually become clogged with use. They may be cleaned by surging the appropriate cleaning solution back and forth through the frit and then rinsing with distilled water in the same fashion. Various substances may be removed from the frits by cleaning with the appropriate solvent, namely, hot hydrochloric acid for dirt, hot concentrated sulphuric acid containing sodium nitrite for organic matter, etc.

4.3.4 *Cleaning and Checking of Glass Impinger*

Glass Impingers used for sampling need to be cleaned thoroughly using chromic acid followed by rinsing few times with distilled water.

Silicon grease is required to be applied on neck joint to make unit leak proof.

Since glass impinger is the key component of gaseous pollutant sampling, a dimensional check is required before starting the sampling. If impinger is made of glass it is likely that some parts may be damaged or interchanged.

Bore size of the middle glass impinging tube shall meet the specified size of within 1.0 ± 0.1 mm. Checking gauge (normally drill bit of 1 mm tolerance is used as go, no go gauge). Refer drawing given in Fig. 2 and Fig. 3.

Gap between middle glass impinging tube jet and bottom of impinger should meet 3 ± 0.1 mm requirement. The gap can be checked using a small circular plate with above tolerance. Once impinger male and female parts are assembled with plate, plate must not move in the bottom.

Impinger male and female parts should not be interchanged to have control and confidence on the measurement.

4.4 Flow Meter

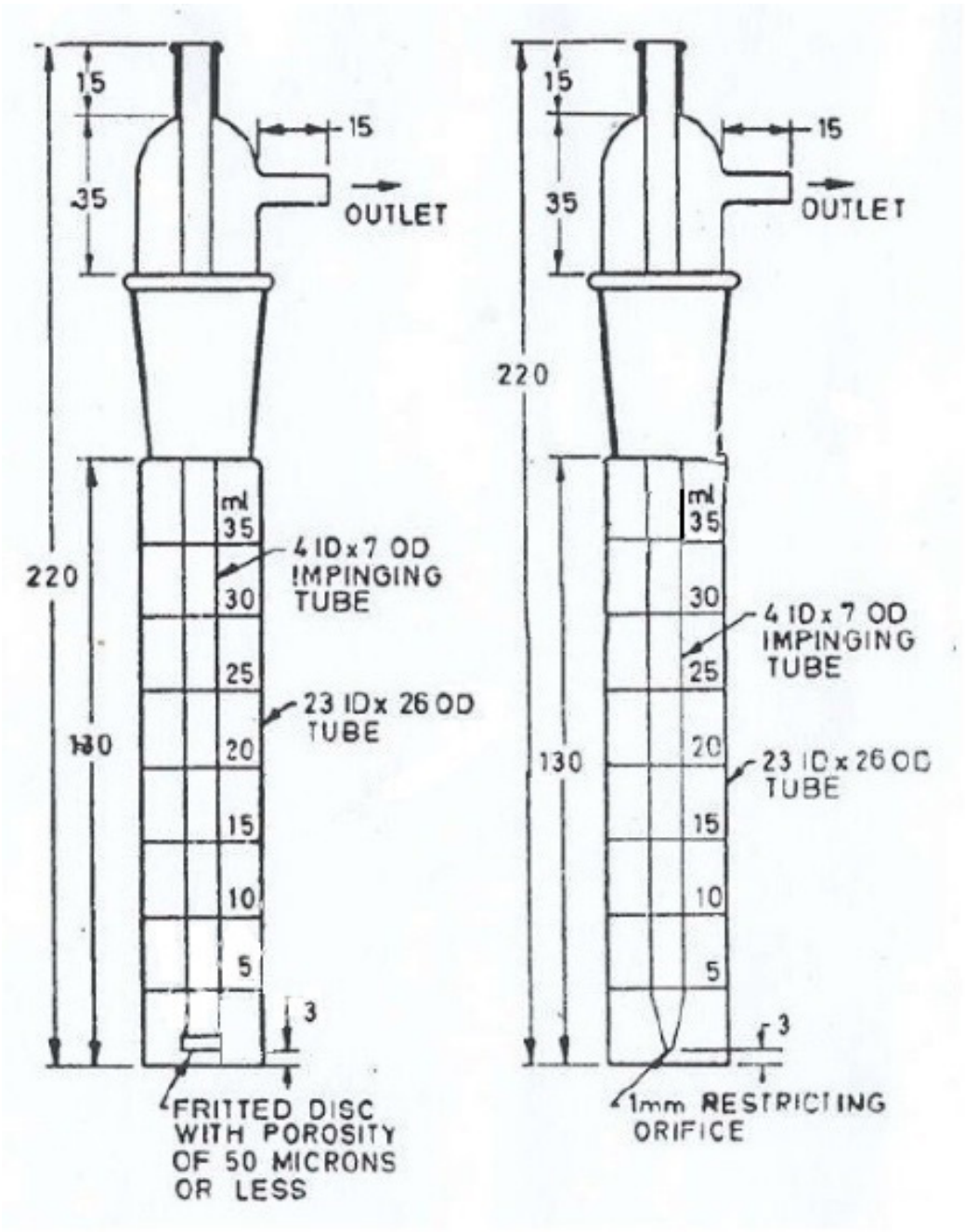
A calibrated rotameter or a total air gas meter calibrated within accuracy of ± 2 percent for the range 0.2 to 2 litres per minute (lpm) is required for gas sampling.

4.5 Flow Control Device

Critical orifice device (*see* Fig 4) can be used to get fixed flow rate. Normally hypodermic needles are used as critical orifice. Typical size of hypodermic needles and associated air flow rate obtained is given below:

4.5.1 *Hypodermic Needle*

Gauge No.	Needle Length (cm)	Air Flow Obtained (lpm)
23	1.58	0.5
27	0.95	0.2



All dimensions in millimetres.

FIG. 2 FRITTER IMPINGER FOR AIR SAMPLING

FIG. 3 STANDARD IMPINGER FOR AIR SAMPLING

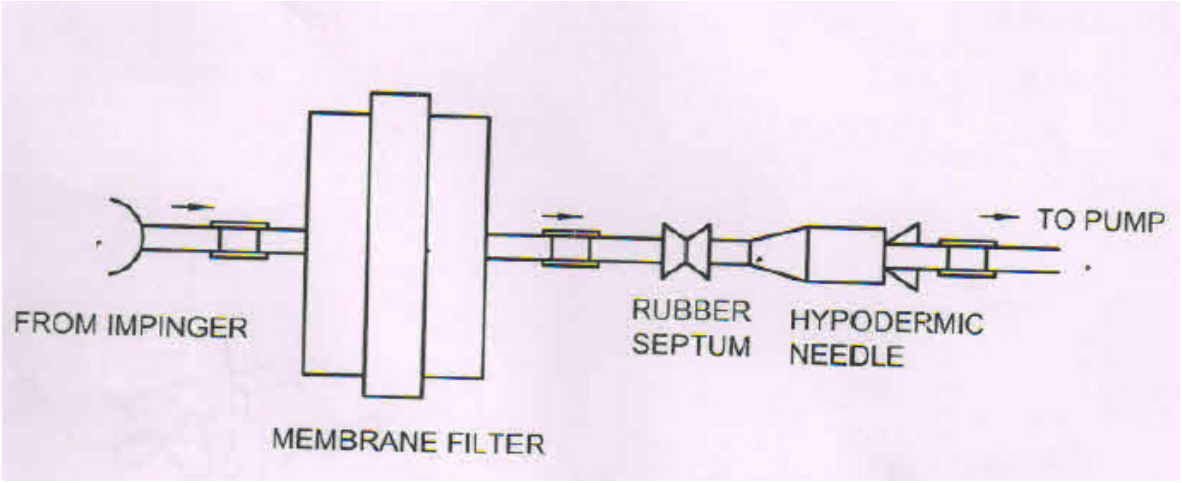


FIG. 4 CRITICAL ORIFICE DEVICE

One can use selected suitable size orifice for controlling the flow during sampling period.

A gas manifold fitted with control valve can also be used to fix the desired sampling flow rate.

4.6 Particulate / Moisture Trap

This can be made up of a glass wool trap or a membrane filter as shown in Fig. 1 or Fig. 4 so that choking of needle does not take place during sampling.

4.7 Pump

A suction device capable of drawing air into the sampling train at the rate of 0.3 to 6 litres per minute with 500 mm Hg vacuum generation capacity and fitted with moisture trap is adequate for sampling of gaseous pollutants.

A light weight pump of continuous rating for 24 h, self lubricating and operating on 230 ± 10 V *ac* 50 Hz is suitable for field sampling of gaseous pollutants.

5 SAMPLING DURATION

5.1 Sampling duration should match with the applicable standard of the gaseous pollutant. However sampling duration also depends upon the expected concentration and climatic condition, multiple samples can be collected as per requirement to work out the desired average concentration of pollutant.

To find sampling duration a time measuring device such as time totalizer or timer should be a part of sampling system. A time totalizer calibrated accurately within accuracy of ± 1 min is required for gaseous sampler.

Based on the practical experience obtained by various organizations working on sampling of gaseous pollutants over several decades in India, following sampling rates may be adopted for indicated sampling period.

a) Up to 4 h. : 1.0 lpm
b) > 4 h – 8 h : 0.8 lpm
c) > 8 h – 24 h : 0.5 lpm

If sampling of gaseous pollutants for longer period of more than 4 h is selected, provision for regular recharge of ice / chilled water or thermoelectric cooling of impinger should be a part of sampling system.

6 CRITERIA OF SAMPLE ACCEPTANCE

Any sample collected for 75 percent of the desired sampling duration can be considered a valid sample.

7 SAMPLING TEMPERATURE

For desired collection efficiency and to save absorbing reagent from evaporation loss it is necessary to keep the temperature of absorbing reagent low. Ice/chilled water/thermo electric cooling device can be used to keep impinger's absorbing reagent cool in the range of 10 - 15°C.

8 LEAKAGE

Sampling system should be leak proof.

All connection of flow meter, flow control valve, moisture trap, hypodermic needle must be leak proof. Provision must be there in the sampling system to check created vacuum in the sampling train up to 100 mm Hg. Vacuum pressure must not fall more than 25 mm Hg in 1 min.

9 SAMPLE STORAGE, HANDLING AND TRANSPORTATION

9.1 Transfer the collected gaseous pollutant absorbing reagent of the midget impingers after measuring final volume of reagent into a neutral leak proof clean and marked sampling bottle.

9.2 Mark all the details of collected sample on the bottle including volume of absorbing reagent taken in impinger for sampling of gaseous pollutants.

9.3 Use insulated cold box for transportation of sample bottle from sampling site to the laboratory for analysis. Temperature during transportation should be maintained in the range 10 – 15°C to prevent significant loss of collected gaseous pollutants. Transferred sample bottle must be stored at below 4°C in refrigerator.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Air Quality Sectional Committee, CHD 35

Organization	*Representative(s)*
Bhabha Atomic Research Centre, Mumbai	Dr Gauri Pandit (***Chairman***)
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Jharkhand State Pollution Control Board, Ranchi	Shri R. N. Kashyap

Organization	*Representative(s)*
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Scientist 'B', CHD

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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